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(54) Clamping device for a cutting insert

Spannvorrichtung für einen Schneideinsatz

Dispositif de serrage pour une plaquette de coupe

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(73) Proprietor: **ISCAR LTD.**
Migdal Tefen 24959 (IL)

(72) Inventors:
• **Friedman, Jacob**
Kfar Vradim 24960 (IL)

• **Barazani, Gideon**
Kiryat Bialik 27212 (IL)

(74) Representative:
VOSSIUS & PARTNER
Siebertstrasse 4
81675 München (DE)

(56) References cited:
EP-A- 0 152 729 **WO-A-93/20972**
US-A- 1 672 458 **US-A- 3 175 426**

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Description

[0001] This invention relates to a metal cutting tool assembly according to the preamble of claim 1 and as known e.g. from EP-A-0152729. The invention relates particularly to such a cutting tool assembly wherein the insert is retainably clamped within the retaining slot between a resiliently displaceable clamping jaw and a rigid base jaw without the use of additional mechanical clamping means such as clamping screws or the like.

[0002] One known form of cutting tool assembly of the kind to which the invention relates involves the so-called "wedge clamping" of the insert in the insert retaining slot. Here, the insert, having a single cutting edge, is provided with a wedge-shaped body which is forcibly inserted and is retained within a correspondingly wedge-shaped retaining slot, the actual clamping of the insert within the slot being effected by the resilient outward displacement of the clamping jaw as a result of the forced insertion of the insert into the slot. With this type of cutting tool assembly, the resilient displacement of the jaw is effected by the insertion of the insert into the slot, but when it is desired to remove the insert, special means have to be provided for mechanically ejecting the insert from the slot, these means involving the direct exertion of an ejection pressure on the insert. It will be understood that both the insertion and removal of the insert is accompanied by significant friction with consequent wear on the blade jaws which are, in general, of a much softer material than that of the insert.

[0003] Alternatively, it is known (GB 1379637) to introduce into and clamp an insert within an insert retaining slot by first of all mechanically displacing outwardly a resiliently clamping jaw, introducing the insert into the slot and then allowing the jaw to spring back on to the insert in a clamping position. When it is desired to remove the insert from the slot, the clamping jaw is again displaced outwardly, allowing for the removal of the insert. The outward displacement of the jaw is effected using a mechanical key which is displaced in frictional contact with the inside of the clamping jaw, thereby leading to frictional wear of the jaw and/or the key.

[0004] It is an object of the present invention to provide a new and improved metal cutting tool assembly in which the above-referred-to disadvantages are substantially reduced or overcome.

[0005] This object is solved with the features of the claims.

[0006] Preferably, there is formed in the holder blade an extension slot communicating with said insert receiving slot and extending rearwardly thereof. There can be formed in the clamping jaw forwardly of said extension slot a clamping jaw aperture, said displacement surface being constituted by a rim of said clamping jaw aperture.

[0007] In accordance with one preferred embodiment of the present invention, the supporting surface is

formed on an upper surface of said clamping jaw adjacent said extension slot, one of said prongs being adapted to project into said clamping jaw aperture whilst the other of said prongs bears on said supporting surface, whereby a levering displacement of said one prong with respect to the other prong results in the outward displacement of said clamping jaw.

[0008] Alternatively, and in accordance with another preferred embodiment of the present invention, the supporting surface is formed in said base jaw, said supporting surface being constituted by a rim of said base jaw aperture and wherein said opening key is provided with means for displacing said prongs apart whereby, with said prongs projecting respectively into said clamping jaw and base jaw apertures, displacement apart of said prongs results in said outward displacement of said clamping jaw.

[0009] Thus, with a cutting tool assembly in accordance with the present invention, displacement of the clamping jaw, whether effected by a levering action or by way of a direct, linearly directed displacement, is not accompanied by any direct contact, either with the insert or with the inner surface of the clamping jaw, and in this way damage thereto is avoided or minimized. Furthermore, introduction into and removal of the insert from the slot is not accompanied by any frictional resistance by the opposite jaw surfaces and there is therefore avoided frictional wear of these surfaces leading to an extended life of the holder blade as a whole.

[0010] For a better understanding of the present invention and to show how the same may be put into practice by way of example, reference will now be made to the accompanying drawings, in which:

Fig. 1 is a side elevation of a holder blade of a cutting tool assembly in accordance with the present invention;

Fig. 2 is a side elevation showing the retention of a cutting insert in the holder blade shown in Fig. 1;

Fig. 3 is a perspective view of the cutting tool assembly shown in Fig. 2, together with an associated retaining slot opening key;

Fig. 4 is a similar view to that shown in Fig. 3, with a modified form of retaining slot opening key;

Fig. 5 is a side elevation of a further form of holder blade for a cutting tool in accordance with the present invention;

Fig. 6 is a perspective view of the holder blade shown in Fig. 5 and a cutting insert clampingly retained therein, together with an appropriately mounted retaining slot opening key;

Fig. 7 is a perspective view of a further form of cutting tool assembly in accordance with the present invention, with an associated retaining slot opening key; and

Fig. 8 is a perspective view of a still further form of cutting tool assembly in accordance with the present invention, with an associated retaining slot

opening key.

[0011] As seen in Fig. 1 of the drawings, a holder blade 1 for a metal cutting tool assembly in accordance with the present invention comprises a rigid body portion 2 with which are formed integrally a clamping jaw 3 and a base jaw 4. The clamping jaw 3 is coupled to the body portion 2 via a relatively narrow neck portion 5, thereby allowing for a limited degree of flexible resilience of the clamping jaw 3 with respect to the body portion 2 and with respect to the base jaw 4, the latter forming a rigid whole with the body portion 2.

[0012] As can be seen in dotted lines in Fig. 1 of the drawings, the clamping jaw 3, in its unstressed position, has its forward tip 6 directed downwardly towards the base jaw 4 and is spaced therefrom by a distance h_1 .

[0013] In order to allow for the introduction of an insert 7 (shown in Fig. 2 of the drawings) having a height h_2 , the clamping jaw 3 must be displaced upwardly in the direction of the arrow 8 (Fig. 1) so that its forward tip 6 is spaced from the base jaw 4 by a distance h_3 where $h_3 > h_2$. As seen in Fig. 1 of the drawings, there is formed in a leading end of the holder blade 1, and defined between opposite surfaces of the clamping jaw 3 and base jaw 4, an insert retaining slot 9, a rear end of which communicates with a rearwardly extending extension 10 of the slot 9 and a lower, curved aperture 11. As can be seen in Fig. 2 of the drawings, the location of the extension 10 is such as to be bordered by the narrow neck portion 5 of the clamping jaw. The lower, curved aperture 11 is provided so as to ensure that the lower, innermost edge of the insert is properly located within the aperture 11 without encountering the slot wall. The retained insert 7 is abutted by an abutment 12 of the body portion 2, and the upper, innermost edge of the insert is located within the extension 10. In this way there is prevented possibly damaging abutment of the inner edges of the insert with the body portion.

[0014] As can furthermore be seen in Fig. 2 of the drawings, with the insert 7 clampingly retained within the insert retaining slot 9, the clamping jaw 3 bears clampingly downwardly on the upper surface of the insert 7 in the direction of the arrow 13.

[0015] There is formed in a leading portion of the clamping jaw 3, forwardly of the neck portion 5, a throughgoing aperture 14 whose rim constitutes a displacement surface, whilst there is formed in the base jaw 4, adjacent a front edge thereof, a throughgoing aperture 15 whose rim constitutes a supporting surface.

[0016] As can be seen in Fig. 2 of the drawings, the narrow neck portion 5 is of a reduced height dimension as compared with the height dimension of the region of the clamping jaw leading portion in which said aperture 14 is formed.

[0017] Reference will now be made to Fig. 3 of the drawings, for a detailed description of an insert retaining slot opening key 21 and the manner in which it is used

in order to open the insert retaining slot so as to allow for the introduction of the insert. As seen in Fig. 3 of the drawings, the retaining slot opening key 21 comprises a body 22 having a pair of integrally formed legs 23a, 23b from which respectively project a pair of spaced-apart prongs 24a, 24b.

[0018] Located between the legs 23a, 23b and bearing against them is a wedge-like spacer 25 having a throughgoing threaded bore 26 through which extends a screw 27, an upper end of which remote from the spacer 25 is coupled to a turning handle 28.

[0019] Rotation of the turning handle 28 in the direction of the arrow 29 results in an inwardly-directed displacement of the spacer 25, thereby giving rise to an outwardly-directed displacement of the legs 23a, 23b and a consequent outwardly-directed displacement of the prongs 24a, 24b in the direction of the arrows 30a, 30b.

[0020] If now, and prior to the rotation of the handle 28 so as to cause the outward displacement of the prongs 24a, 24b, the latter are inserted in the apertures 15, 14 and rotation of the handle 28 takes place in the direction of the arrow 29, it will be readily seen that there occurs an outwardly-directed displacement of the clamping jaw 3. As a consequence, the clamping jaw 3 effectively pivots about its narrow neck portion 5, thereby increasing the spacing between the clamping jaw 3 and the base jaw 4 and allowing for the introduction or removal of the insert 7. Rotation of the handle 28 in the opposite direction allows for the clamping jaw 3 to return into a clamped position, thereby clampingly retaining the insert in position.

[0021] Fig. 4 shows a modified form of turning key 33 having a fixed projecting prong 34a and an eccentrically rotatable projecting prong 34b which is coupled to a turning handle 35, rotation of which in one sense gives rise to widening the spacing between the prongs 34a, 34b and rotation in the other sense from this widened spacing results in a return to the original spacing.

[0022] If now, as before, the prongs 34a, 34b are positioned within the apertures 15, 14, rotation of the handle in one sense gives rise to an outwardly-directed displacement of the clamping jaw, allowing for the insertion or removal of the insert.

[0023] It will be appreciated that, in the embodiments shown in Figs. 3 and 4 of the drawings, a rim of the aperture 14 in the clamping jaw 3 constitutes a clamping jaw displacement surface, whilst a rim of the aperture 15 in the base jaw 4 constitutes a support surface.

[0024] Reference will now be made to Figs. 5 and 6 of the drawings where, as can be seen, the clamping and base jaws define between them, as before, an insert retaining slot which communicates with a rearwardly-directed extension 10 and a lower, curved aperture 11.

[0025] As before, there is formed in the clamping jaw 3 a throughgoing aperture 14, but in this embodi-

ment there is not formed any through-going aperture in the base jaw 4. As seen in Fig. 6 of the drawings, a slot opening key 41 is formed with a pair of spaced-apart, fixed cylindrical prongs 42a, 42b with the prong 42a extending through the aperture 14 whilst the prong 42b rests on the upper surface of the holder blade 1. If now the key is rotated in the direction of the arrow 43, it can be seen that there will be a levering displacement outwardly of the clamping jaw 3 with respect to the base jaw 4. In this embodiment, the rim of the aperture 14 serves as a displacement surface whilst the upper surface of the holder blade 1, upon which rests the prong 42b, serves as a supporting surface.

[0026] In a modified embodiment shown in Fig. 7 of the drawings, a rearwardly-directed extension 10' of the insert retaining slot 9 is shaped to receive the prong 42b of the key 41, with the other prong 42a extends through the aperture 14. Here again, upon rotation of the key 41 in the direction of the arrow, a levering outward displacement of the clamping jaw is effected with respect to the base jaw 4. In the case of this embodiment, the rim of the aperture 14 again constitutes a displacing surface whilst the rim of the extension 10' constitutes a supporting fulcrum surface.

[0027] In a still further modification shown in Fig. 8 of the drawings, an additional aperture 45 is formed in an upper portion of the body portion 2 of the holder, adjacent to and spaced from the aperture 14 and displaced rear wardly with respect to the slot extension. If now the prongs 42a, 42b are inserted in the apertures 14, 45 and the key is rotated in the direction of the arrow, levering outward displacement of the clamping jaw is effected about the fulcrum constituted by the prong 42b, with the rim of the aperture 14 constituting a displacement surface and the rim of the aperture 45 constituting a supporting fulcrum surface.

[0028] Whilst in the embodiments specifically described above clamping retention of a cutting insert having substantially parallel upper and lower surfaces has been described, it will be readily appreciated that the present invention can be extended to the so-called "wedge clamping" of inserts having a wedge-shaped body portion arranged to be retained within a corresponding wedge-shaped slot formed in the holder blade.

[0029] It will be furthermore understood that the present invention is not restricted to any particular kind of cutting insert such as, for example, the cutting insert specifically illustrated, but is readily applicable to other forms of cutting inserts.

Claims

1. A metal cutting tool assembly comprising a rigid holder blades (1)

an insert receiving slot (9) formed in a leading end of the holder blade (1) and defined

between a resiliently displaceable clamping jaw (3) formed integrally with said holder blade (1) and rigid base jaw (4) forming part of the holder blades (1);

spaced apart displacement and supporting surfaces (14,15) respectively formed in or on said clamping jaw (3) and said holder (2); said clamping jaw (3) having a leading portion and a tailing portion about which it is resiliently displaceable relative to said base jaws (4), characterized in that

said displacement surface (14) is formed substantially on said clamping jaw (3) leading portion and spaced apart from said retaining slot (9); and

a slot opening key (21, 33, 41), a pair of spaced apart projecting prongs (24a, 24b; 34a, 34b; 42a, 42b) of said key (21, 33, 41) adapted to engage said surfaces (14, 15) at least one of said prongs being displaceable with respect to said holder blade (1) so as to resiliently displace said clamping jaw (3) outwardly with respect to said base jaw (4) into an opening position for insertion or removal of an insert (7).

2. The assembly according to Claim 1, wherein said clamping jaw trailing portion is coupled to a body portion of said rigid holder blade (1) via a relatively narrow neck portion (5) of a reduced height dimension as compared with the height dimension of the region of the clamping jaw (3) leading portion on which said displacement surface (14) is formed, said dimensions being transverse to a longitudinal direction of said clamping jaw (3).
3. The assembly according to Claim 1 or 2, wherein a first aperture is formed in said clamping jaw leading portion having an aperture rim constituting said displacement surface (14).
4. The assembly according to Claim 1, 2 or 3, wherein a second aperture is formed in said holder blade spaced from said first aperture and having an aperture rim constituting said supporting surface (15).
5. The assembly according to Claim 4, wherein said second aperture is formed in said base jaw substantially opposite said first aperture and said slot opening key (21,33) further comprises means (25,28) for displacing said prongs (24a, 24b, 34a, 34b) apart.
6. The assembly according to Claim 5, wherein said means for displacing said prongs (24a, 24b) apart includes a wedge-like spacer (25).
7. The assembly according to Claim 5, wherein said means for displacing said prongs apart includes a

fixed prong (34a) and an eccentrically rotatable prong (34b).

8. The assembly according to Claim 4, wherein said second aperture is formed substantially adjacent said clamping jaw trailing portion, and wherein a rotational movement of said key (41) about a first prong engaging said supporting surface, displaces said clamping jaw (3) relative to said base jaw (4). 5
9. The assembly according to Claim 1, 2 or 3, wherein said supporting surface is formed on an edge surface of said holder blade (1) constituting a continuation of the trailing edge surface of said clamping jaw (3) and wherein a rotational movement of said key (41) about a first prong engaging said supporting surface displaces said clamping jaw (3) relative to said base jaw (4). 10 15
10. The assembly according to Claim 1, 2 or 3, wherein said supporting surface is formed as a trailing extension of said insert retaining slot (9) and wherein a rotational movement of said key (41) about a first prong (42b) engaging said supporting surface displaces said clamping jaw (3) relative to said base jaw (4). 20 25

Patentansprüche

1. Metallschneidwerkzeuganordnung mit: 30

einem starren Halterabschnitt (1);
einem Einsatzaufnahmeschlitz (9), der in einem vorderen Ende des Halterabschnitts (1) ausgebildet und zwischen einer mit dem Halterabschnitt (1) einstückig ausgebildeten, elastisch bewegbaren bzw. verstellbaren Spannbacke (3) und einer einen Teil des Halterabschnitts (1) bildenden starren Basisbacke (4) definiert ist; 35
voneinander beabstandeten Verstell- und Halteflächen (14, 15), die in oder auf der Spannbacke (3) bzw. dem Halter (2) ausgebildet sind; wobei die Spannbacke (3) einen vorderen Abschnitt und einen hinteren Abschnitt aufweist, um den sie bezüglich der Basisbacke (4) elastisch bewegbar bzw. verstellbar ist; 40
dadurch gekennzeichnet, daß
die Verstellfläche (14) im wesentlichen auf dem vorderen Abschnitt der Spannbacke (3) ausgebildet und vom Aufnahmeschlitz (9) beabstandet ist; und 45
mit einem Schlitzöffnungsschlüssel (21, 33, 41), wobei ein Paar beabstandete, hervorstehende Klauen (24a, 24b; 34a, 34b; 42a, 42b) des Schlüssels (21, 33, 41) dazu geeignet sind, mit den Flächen (14, 15) in Eingriff zu kommen, wobei mindestens einer der Klauen bezüglich 50 55

des Halterabschnitts (1) bewegbar bzw. verstellbar ist, um die Spannbacke (3) bezüglich der Basisbacke (4) elastisch nach außen in eine Öffnungsposition zu bewegen bzw. verstellen, in der ein Einsatz (7) einsetzbar oder entfernbar ist.

2. Spannvorrichtung nach Anspruch 1, wobei der hintere Spannbackenabschnitt über einen relativ schmalen Halsabschnitt (5) mit einem Höhenmaß, das kleiner ist als das Höhenmaß des Bereichs des vorderen Abschnitts der Spannbacke (3), auf dem die Verstellfläche (14) ausgebildet ist, mit einem Körperabschnitt des starren Halterabschnitts (1) verbunden ist, wobei die Höhenmaße quer zur Längsrichtung der Spannbacke (3) definiert sind.
3. Spannvorrichtung nach Anspruch 1 oder 2, wobei im vorderen Spannbackenabschnitt eine erste Öffnung mit einer Öffnungseinfassung ausgebildet ist, der die Verstellfläche (14) bildet.
4. Spannvorrichtung nach Anspruch 1, 2 oder 3, wobei im Halterabschnitt eine von der ersten Öffnung beabstandete zweite Öffnung mit einer Öffnungseinfassung ausgebildet ist, der die Haltefläche (15) bildet.
5. Spannvorrichtung nach Anspruch 4, wobei die zweite Öffnung in der Basisbacke im wesentlichen gegenüberliegend der ersten Öffnung ausgebildet ist, und wobei der Schlitzöffnungsschlüssel (21, 33) ferner eine Einrichtung (25, 28) zum Auseinanderbewegen der Klauen (24a, 24b, 34a, 34b) aufweist.
6. Spannvorrichtung nach Anspruch 5, wobei die Einrichtung zum Auseinanderbewegen der Klauen (24a, 24b) ein keilförmiges Abstandselement (25) aufweist.
7. Spannvorrichtung nach Anspruch 5, wobei die Einrichtung zum Auseinanderbewegen der Klauen eine feststehende Klaue (34a) und eine exzentrisch drehbare Klaue (34b) aufweist.
8. Spannvorrichtung nach Anspruch 4, wobei die zweite Öffnung im wesentlichen in der Nähe des hinteren Spannbackenabschnitts ausgebildet ist, und wobei die Spannbacke (3) bezüglich der Basisbacke (4) durch eine Drehbewegung des Schlüssels (41) um eine mit der Haltefläche in Eingriff stehende erste Klaue verstellt wird.
9. Spannvorrichtung nach Anspruch 1, 2 oder 3, wobei die Haltefläche auf einer Randfläche des Halterabschnitts (1) ausgebildet ist, die eine Fortsetzung der hinteren Randfläche der Spannbacke (3) bildet, und wobei die Spannbacke (3) bezüglich

der Basisbacke (4) durch eine Drehbewegung des Schlüssels (41) um eine mit der Haltefläche in Eingriff stehende erste Klaue bewegt bzw. verstellt wird.

10. Spannvorrichtung nach Anspruch 1, 2 oder 3, wobei die Haltefläche als hintere Erweiterung des Einsatzaufnahmeschlitzes (9) ausgebildet ist, und wobei die Spannbacke (3) bezüglich der Basisbacke (4) durch eine Drehbewegung des Schlüssels (41) um eine mit der Haltefläche in Eingriff stehende erste Klaue (42b) bewegt bzw. verstellt wird.

Revendications

1. Ensemble d'outil de coupe de métal comportant une lame de support rigide (1), une fente de réception de plaquette (9) formée dans une extrémité avant de la lame de support (1) et définie entre une mâchoire de serrage (3) déplaçable de manière élastique formée venue de matière avec ladite lame de support (1) et une mâchoire de base rigide (4) formant une partie de la lame de support (1),

des surfaces de déplacement et de support écartées (14, 15) formées respectivement dans ladite mâchoire de serrage (3) et ledit support (2) ou sur ceux-ci,

ladite mâchoire de serrage (3) ayant une partie de tête et une partie de queue autour de laquelle elle peut se déplacer de manière élastique par rapport à ladite mâchoire de base (4), caractérisé en ce que

ladite surface de déplacement (14) est formée sensiblement sur ladite partie de tête de la mâchoire de serrage (3) et est écartée de ladite fente de retenue (9), et

une clé d'ouverture de fente (21, 33, 41), une paire de dents faisant saillie de manière écartée (24a, 24b ; 34a, 34b ; 42a, 42b) à partir de ladite clé (21, 33, 41) étant adaptée pour venir en contact avec lesdites surfaces (14, 15) au moins une desdites dents pouvant être déplacée par rapport à ladite lame de support (1) de manière à déplacer élastiquement ladite mâchoire de serrage (3) vers l'extérieur par rapport à ladite mâchoire de base (4) jusqu'à une position d'ouverture destinée à l'insertion ou l'enlèvement d'une plaquette (7).

2. Ensemble selon la revendication 1, dans lequel ladite partie de queue de la mâchoire de serrage est reliée à une partie de corps de ladite lame de support rigide (1) via une partie de col relativement étroit (5) ayant une hauteur réduite par comparaison à la hauteur de la zone de la partie de tête de la mâchoire de serrage (3) sur laquelle est formée

ladite surface de déplacement (14), lesdites dimensions étant transversales à la direction longitudinale de ladite mâchoire de serrage (3).

3. Ensemble selon la revendication 1 ou 2, dans lequel une première ouverture est formée dans ladite partie de tête de mâchoire de serrage en ayant un contour d'ouverture constituant ladite surface de déplacement (14).

4. Ensemble selon la revendication 1, 2 ou 3, dans lequel une seconde ouverture est formée dans ladite lame de support en étant écartée de ladite première ouverture et en ayant un contour d'ouverture constituant ladite surface de support (15).

5. Ensemble selon la revendication 4, dans lequel ladite seconde ouverture est formée dans ladite mâchoire de base étant sensiblement opposée à ladite première ouverture et ladite clé d'ouverture (21, 33) comporte de plus des moyens (25, 28) pour déplacer lesdites dents (24a, 24b, 34a, 34b) en les écartant.

6. Ensemble selon la revendication 5, dans lequel lesdits moyens pour déplacer lesdites dents (24a, 24b) en les écartant comportent un écarteur analogue à un coin (25).

7. Ensemble selon la revendication 5, dans lequel lesdits moyens pour écarter lesdites dents comportent une dent fixe (34a) et une dent excentrée pouvant tourner (34b).

8. Ensemble selon la revendication 4, dans lequel ladite seconde ouverture est formée sensiblement adjacente à ladite partie de queue de mâchoire de serrage, et dans lequel le mouvement de rotation de ladite clé (41) autour d'une première dent qui est en contact avec ladite surface de support, déplace ladite mâchoire de serrage (3) par rapport à ladite mâchoire de base (4).

9. Ensemble selon la revendication 1, 2 ou 3, dans lequel ladite surface de support est formée sur une surface de bord de ladite lame de support (1) constituant un prolongement de la surface de bord de queue de ladite mâchoire de serrage (3), et dans lequel un mouvement de rotation de ladite clé (41) autour d'une première dent en contact avec ladite surface de support déplace ladite mâchoire de serrage (3) par rapport à ladite mâchoire de base (4).

10. Ensemble selon la revendication 1, 2 ou 3, dans lequel ladite surface de support est formée en tant que prolongement de queue de ladite fente de retenue de support (9) et dans lequel un mouvement de rotation de ladite clé (41) autour d'une première

dent (42b) en contact avec ladite surface de support déplace ladite mâchoire de serrage (3) par rapport à ladite mâchoire de base (4).

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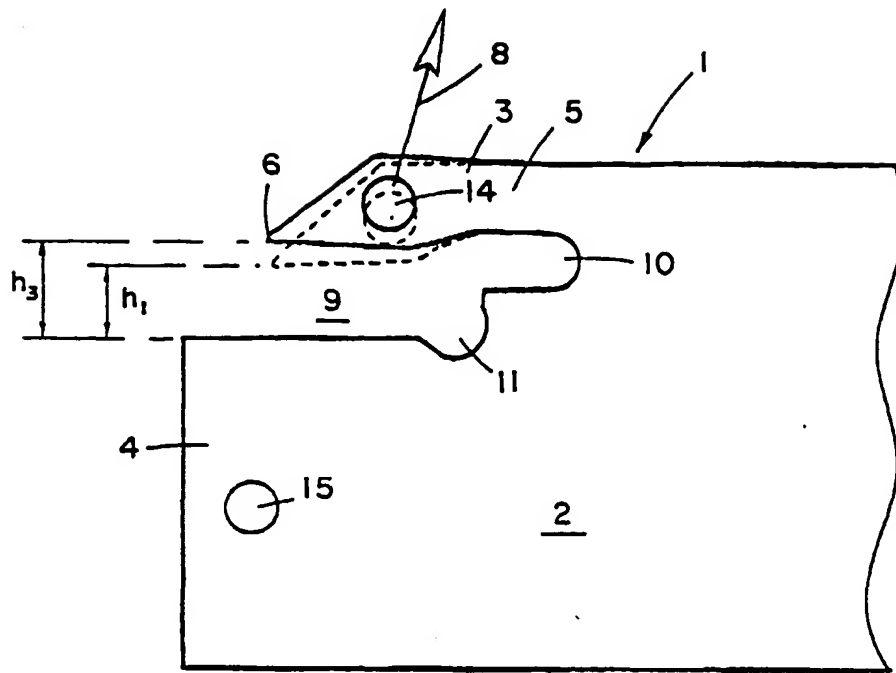


Fig.1

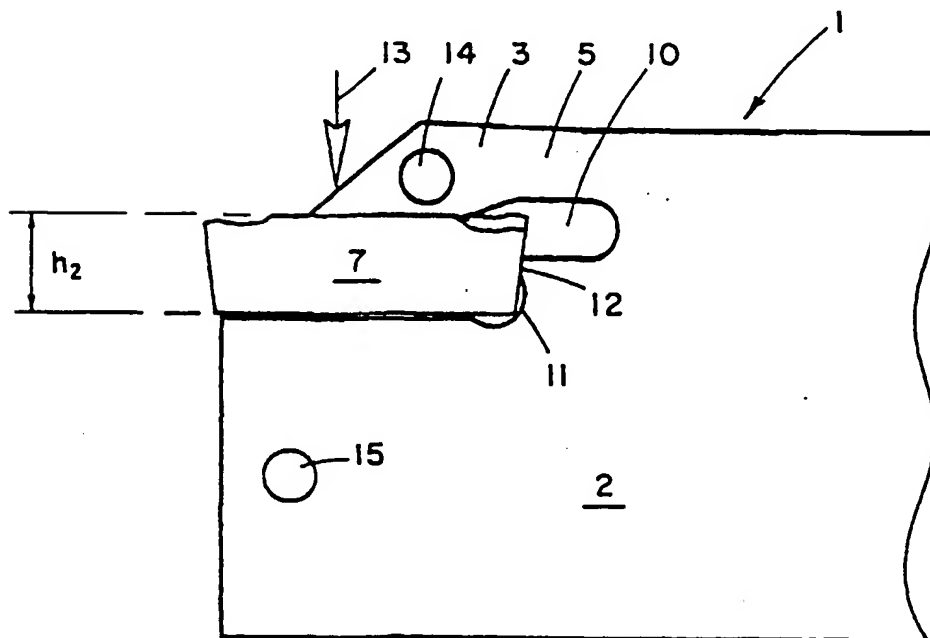


Fig.2

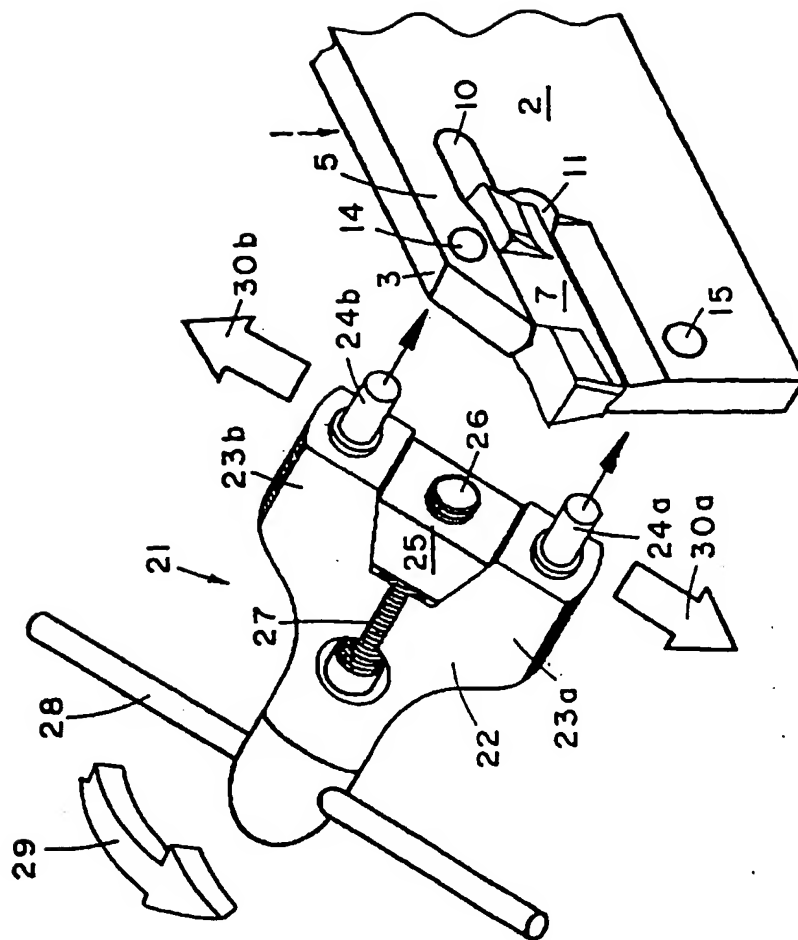
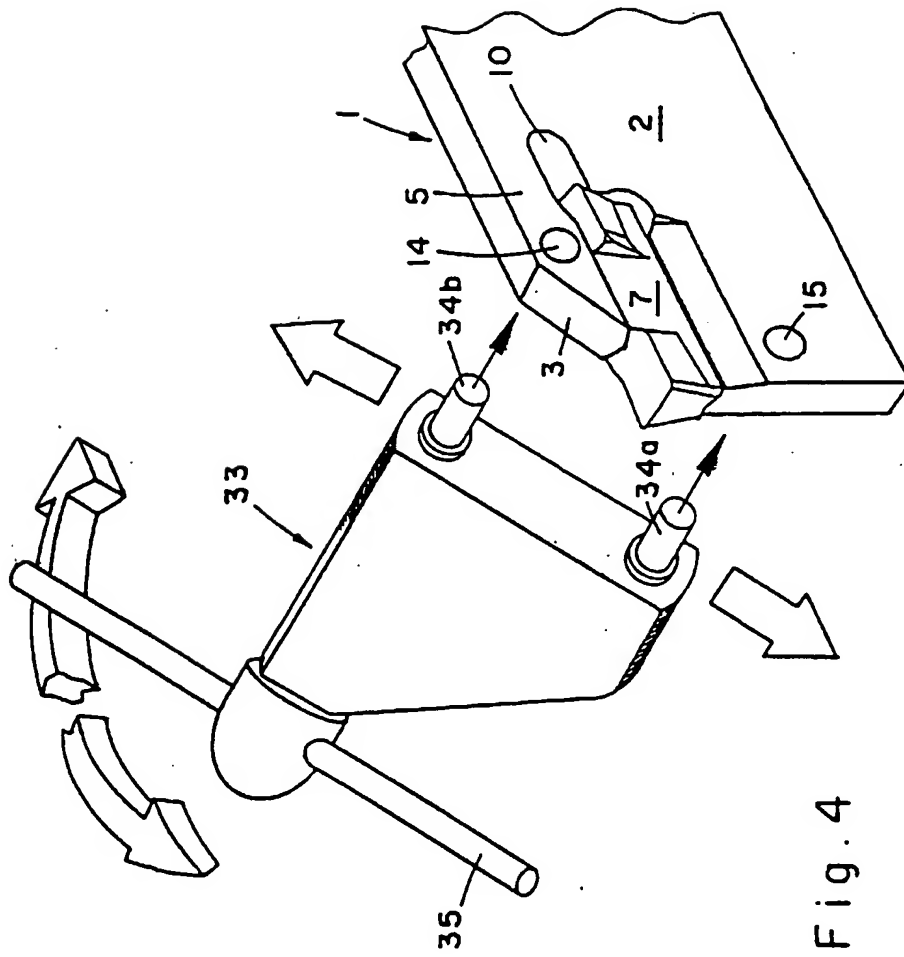


Fig. 3



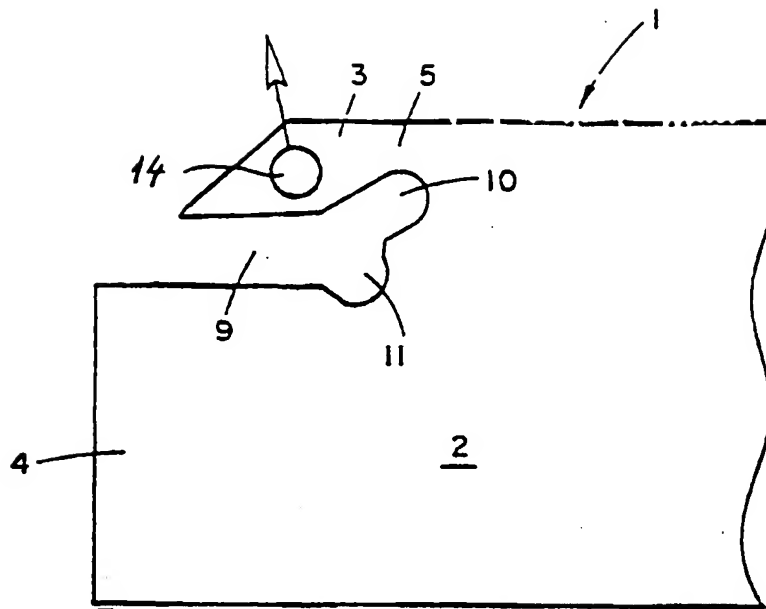


Fig. 5

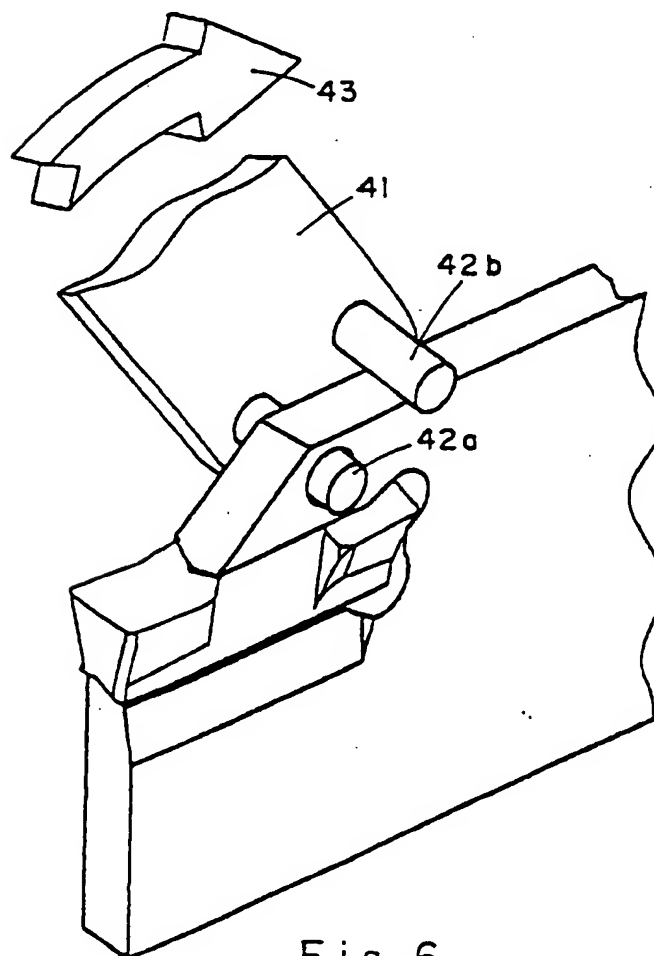


Fig. 6

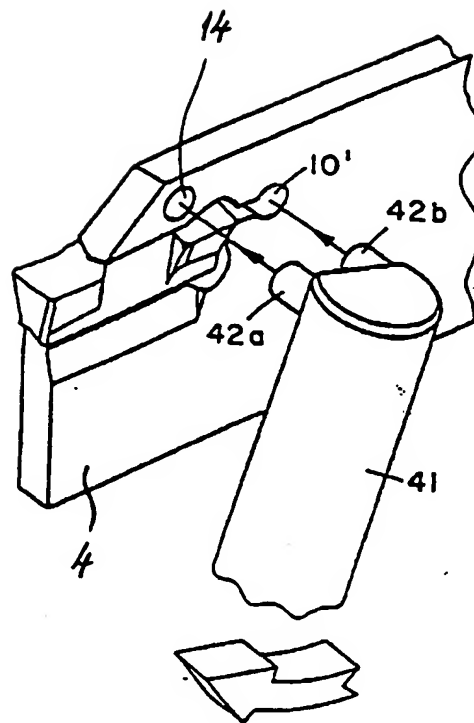


Fig. 7

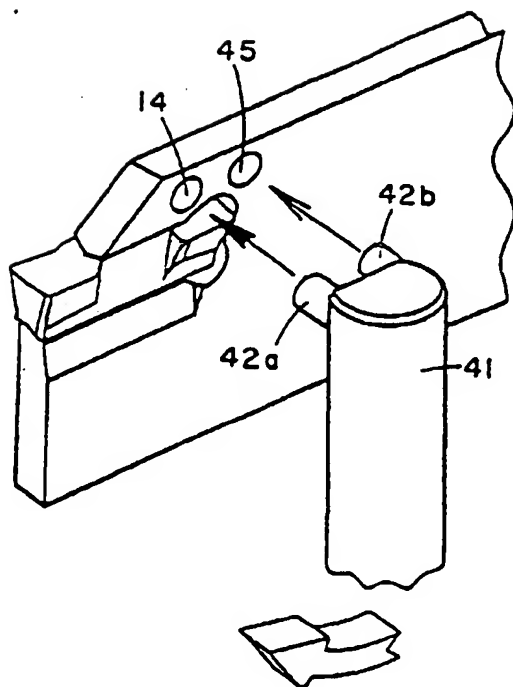


Fig. 8